

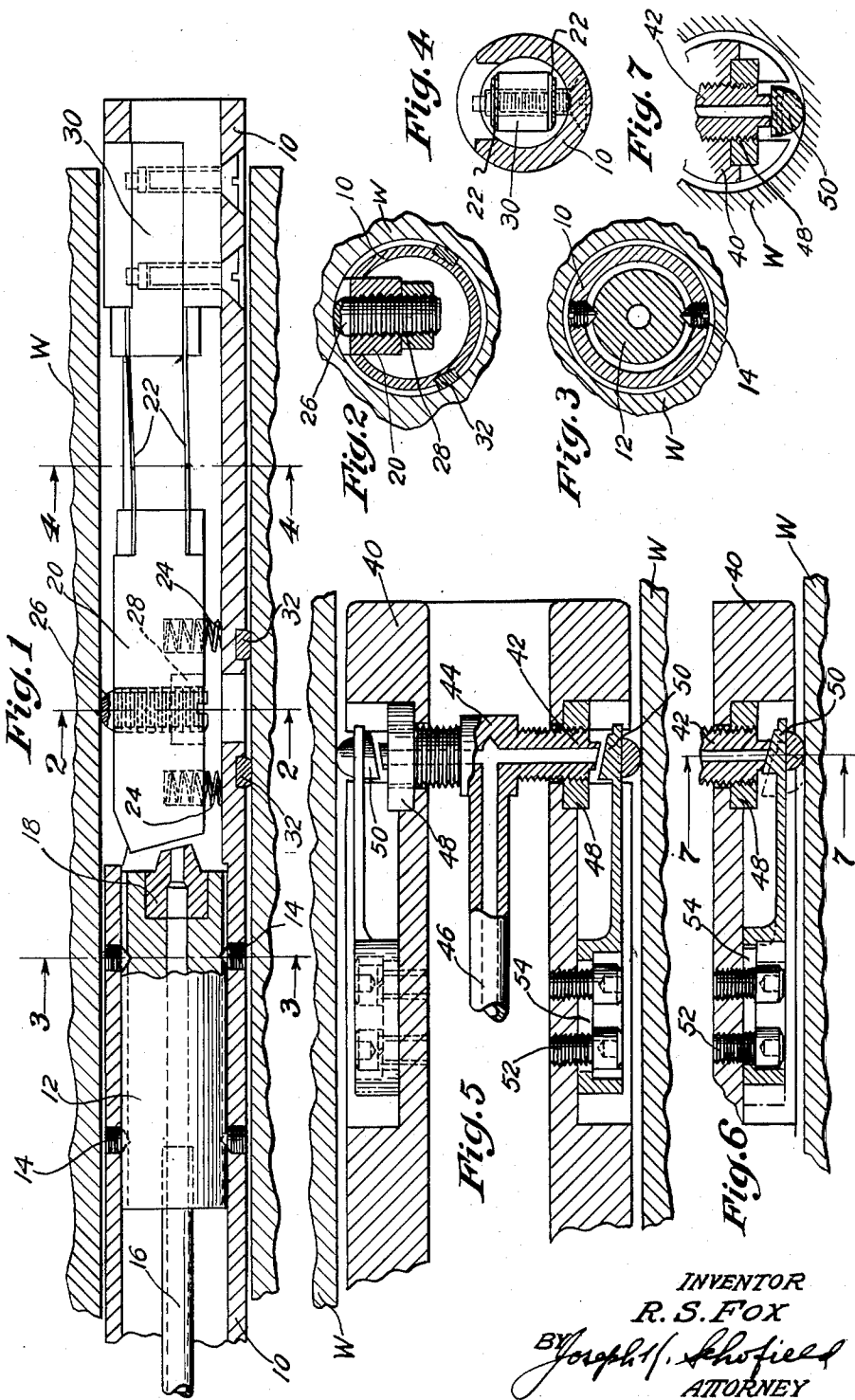
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GAUGE HEAD FOR PNEUMATIC GAUGES

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GAUGE HEAD FOR PNEUMATIC GAUGES

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This invention relates to precision dimension gages, and more particularly to pneumatic gages for small, elongated bores, such as the barrels of fire arms.

An object of importance of the invention is to provide a precision internal dimension gage adapted particularly for determining minute variations in diameter of an elongated bore throughout the length of the bore.

Another object of the invention is to provide a reduced closing effect of the nozzle closing member in its movements toward and from the orifice of the air nozzle compared to its radial movements, by engagement with the surface of the work piece being gaged.

Another object of the invention is to provide an adjustment of the work engaging and nozzle closing member to vary the opening between the end face of the nozzle and that of the work engaging and nozzle closing member, so that the gage may be adjusted for variable diameters while maintaining the same gap or opening of the closing surface relative to the nozzle orifice.

And finally, it is an object of the invention to provide the end face of the member in which the nozzle orifice is provided at an oblique angle to the axis of the bore being gaged, and to provide a correspondingly obliquely disposed surface on the nozzle closing and work engaging member adjacent the nozzle end face.

The operation of air gages, in which the distance of the orifice of the nozzle from the surface of the work piece being gaged varies more than a few thousandths of an inch, has heretofore proven unsatisfactory. Air gages normally have been successfully used for gaging variations in diameter of about three or four thousandths, but when greater variations are encountered, complications, inaccuracies, and varying sensitivities have occurred. It is, however, frequently desirable to gage, in a single operation, dimensions varying as much as 30 to 50 thousandths. In gages made according to the present invention, the movable work engaging member, or members, will move this amount, but due to the angular disposition of the nozzle orifice in the gage relative to the surface of the work contacting member, the effective closing movement of the surface on the movable work contacting member directly toward the nozzle end face is much less than the radial movement of the work engaging member. This ratio of movement of the gaging member toward its nozzle end face relative to the radial movement of the contacting member may be varied over a

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wide range, by choosing suitable oblique angles for the end face of the nozzle and the opposing end face of the radially movable nozzle closing and work engaging member. By making the end face of the nozzle approximately 84° from the axis of the bore being gaged, and making the end face of the movable gaging member parallel thereto, radial movement of the gaging member will be approximately ten times the effective closing movement of the oblique face of the movable gaging member toward and from the oblique end face of the nozzle. It will be understood, of course, that the planes of the nozzle end face and of the work engaging member will be parallel to each other and so disposed that radial movement of the movable gaging member will open and close the gap between the orifice of the nozzle and the opposing face of the work contacting member.

The gaging of small, elongated bores, such as those in fire arms of machine gun calibers, necessarily covers a relatively wide dimensional range to gage the progressive fire wear of the barrel periodically over the effective life of the gun. For that purpose, the present gage has been provided, in which the gage head is in the form of a sleeve fitting readily within the minimum bore to be gaged.

With the above and other objects in view, the invention may include the features of construction and operation set forth in the following specification and illustrated in the accompanying drawing.

In the accompanying drawing annexed hereto and forming a part of this specification, I have shown the invention embodied in two gage heads of slightly different types, both of which are for elongated bores, either plain or rifled, but it will be understood that the invention can be otherwise embodied and that the drawing is not to be construed as defining or limiting the scope of the invention, the claims appended to this specification being relied upon for that purpose.

In the drawing:

Figure 1 is a central longitudinal section of a gage head made according to the present invention, the head being shown upon an enlarged and somewhat exaggerated scale to more clearly show its construction;

Figure 2 is a transverse sectional view, taken on the plane of line 2—2 in Figure 1;

Figure 3 is a transverse sectional view, taken on the plane of line 3—3 of Figure 1;

Figure 4 is a transverse sectional view, taken on the plane of line 4—4 of Figure 1;

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Figure 5 is a longitudinal fragmentary view of another form of the invention, having opposed, axially adjustable work contacting members;

Figure 6 is a fragmentary view, showing one of the work contacting members of the gage shown in Figure 5 in a different position of axial adjustment; and

Figure 7 is a transverse sectional view, taken on the plane of line 7-7 of Figure 6.

In the above mentioned drawing, there have been shown but two embodiments of the invention which are now deemed preferable. It is to be understood, however, that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

Briefly, and in its preferred aspect, the invention may include the following principal parts; first, an elongated sleeve; second, a conduit within the sleeve to which air is supplied from a suitable source at constant pressure; third, a nozzle at the inner end of the conduit, the end face of which is disposed at an oblique and steep angle to the axis of the sleeve; fourth, a radially movable member mounted within the sleeve, having a work contacting portion and an end face adjacent and parallel to the nozzle end face and at an oblique angle to the axis of the sleeve; fifth, a flexible strip or strips for supporting and permitting limited radial movement of the work contacting member toward and from the nozzle, and sixth, in the modified form shown in Figures 5, 6 and 7, axial adjusting means for the flexibly mounted nozzle closing work contacting members.

Referring more in detail to the figures of the drawing and first to Figures 1 to 4, in which one preferred embodiment of the invention is shown, it will be seen that an elongated sleeve 10 is provided, adapted to fit readily within the gun barrel or other part W being gaged. Within one part of the sleeve 10 is a member 12 secured in spaced relation to the wall of the sleeve as by screws 14 and to which air is admitted from a suitable source under pressure through a supply conduit 16. Within the inner end of this member 12 may be inserted in fixed position therein, a nozzle member 18, the inner end face of which, forming the orifice for the air supply, is at a steep oblique angle approximately 80° or more to the axis of the sleeve 10. As the supply of air to the conduit 16 may be in every way similar to the supply of air to the conventional forms of pneumatic gages, a description is not thought necessary.

Positioned in opposed relation to the end face or orifice of the air nozzle 18 is the correspondingly oblique end face of a radially movable member 20. This member 20, as shown in Fig. 1, is supported on parallel flexible thin metal strips 22 so that during its movement transversely of the tube, the end face adjacent the nozzle will be maintained always in accurate parallel relation to the nozzle orifice. This member 20 is forced laterally by one or more springs 24, so that a transversely adjustable member 20 mounted on the member, may, at its outer end, always contact the surface of the part W being gaged. For this purpose, the sleeve is cut away and the adjustable member 20, when the sleeve is passed through the bore being gaged, is in constant contact with the surface being gaged. The adjustable member 20 may be in the form of a screw threaded transversely through the radially movable member 20 and may be locked in any desired position by means of a nut 26. To support this radially or transversely movable mem-

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ber 20, the thin strips 22 are attached, as shown, to a block 30 secured at the inner end of the sleeve 10.

Inserted in the circumferential surface of the sleeve 10 are bearing members 32 adjacent the radially movable member 20 and disposed at 120° from the member 26. The sleeve 10, therefore, contacts the bore being gaged at three spaced points about the portion being gaged, the two bearing members 32 being fixed in position and the movable member 20 being resiliently pressed at all times toward the surface being gaged but free to move radially in either direction as the bore varies in diameter.

It will be seen by an inspection of Fig. 1, that due to the oblique disposition of the orifice of nozzle 18 and the adjacent opposed oblique surface of the transversely movable member 20, the nozzle closing effect of the end face of the transversely movable member 20 will be much less than the radial movement of this member. With the faces formed at the oblique angle shown in Fig. 1, the closing effect on the nozzle opening of member 20 will be approximately one-tenth its radial movement.

In the operation of this form of gage and with a limited and controlled amount of air admitted to the conduit 16 from a constant pressure source in the conventional manner, the sleeve 10 is passed through the barrel or other member W being gaged during which the end surface of member 20 on the flexibly mounted member 20 contacts portions of the surface being gaged and correspondingly moves slightly in a transverse or radial direction. This movement of member 20 moves its oblique end face toward and from the orifice of nozzle 18 and allows more or less air to escape from the orifice. By noting variations in the pressure within conduit 16, due to the variations in clearance between the nozzle orifice and oblique end face of member 20, or by recording these pressure differences as by a recorder shown in the patent to Moore 2,374,154, granted April 17, 1945, the variations in diameter along the member W being gaged may be determined or recorded.

During operation of the gage, and with the nozzle orifice and radially movable member 20 in any work engaging position, the air discharged from the nozzle orifice is free, without building up pressure, to pass through the sleeve and tube or barrel being gaged by the open space between the sleeve 10 and member W being gaged.

The form of invention shown in Figs. 5, 6 and 7 enables the nozzle clearance between its orifice and the surface of the work engaging member opposed thereto to be adjusted over a relatively wide distance. Work of widely different diameters may therefore be gaged by axial adjustment of the work engaging member. Particular diameters over a relatively large range may be gaged with the same normal gap. By this adjustment of the work engaging member the most efficient nozzle opening can be chosen for work pieces being gaged having diameters varying between different limits.

In this embodiment of the invention, the sleeve 40 is provided with two nozzle orifices 42 in diametrically opposed relation to each other. For this purpose, a T member 44 is mounted within the sleeve 40 through which air under pressure may be admitted from a conduit 46 similarly to the supply for the gage shown in Figs. 1 to 4. Preferably, and as shown, the T member 44 has its oppositely extended arms threaded and is re-

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tained in position in the sleeve by suitable nuts 48 threaded over their ends. The outer end surfaces of these threaded members form the orifices of the nozzles and are disposed, as shown, at an oblique angle of approximately 20° relative to axis of the sleeve.

Lying over each nozzle orifice is the corresponding oblique end surface of a work contacting member 50. This member, as shown, is elongated and flexible so that it may flex radially by engagement of its outer portion against the surface of the bore being gaged. At the opposite end of member 50, from its nozzle closing surface, it is attached as by means of screws 52 to the sleeve 40. The screws 52 pass through elongated slots 54 formed in the members 50 at their secured ends so that the member 50 may be adjusted axially of the sleeve and secured in any axial position. The effect of this axial adjustment is to vary the clearance between the orifice of nozzle 42 and the opposed inclined surface of the work contacting member 50. By adjusting the axial position of the work engaging members 50, the clearance for air escaping past the nozzle may be so adjusted that the opening may be always within the same ideal range for distances being gaged. By means of this axial adjustment, the gage may be adjusted for dimensions over a relatively wide range while maintaining the same sensitivity over the entire range.

I claim:

1. A gage head for pneumatic gages comprising a cylindrical sleeve, a nozzle therein having its front face in a plane at a steep oblique angle to the axis of the sleeve, and a work contacting member flexibly mounted for transverse move-

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ment within said sleeve, said work contacting member having its end face in a plane adjacent said nozzle end face and parallel thereto.

2. A gage head for pneumatic gages comprising a cylindrical sleeve, a nozzle therein having its front face in a plane at a steep oblique angle to the axis of the sleeve, and a work contacting member mounted for movement to limited transverse positions parallel to each other, said work contacting member having its end face in a plane adjacent said nozzle end face and parallel thereto.

3. A gage head for pneumatic gages comprising a cylindrical sleeve, a nozzle therein having its front face in a steep oblique transverse plane relative to the axis of said sleeve, and a work contacting member flexibly mounted within said sleeve, said working contacting member having its end face adjacent said nozzle and parallel thereto.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,099,992	Sutcliffe	Nov. 23, 1937
2,374,154	Moore	Apr. 17, 1945
2,490,375	Rupley	Dec. 6, 1949

FOREIGN PATENTS

Number	Country	Date
812,000	France	Apr. 27, 1937